$4m+1$. All bisectors thus formed, will be the bisectors for 13 trapezoids.

List for 1885, giving the parallel sides.   List for 1105.

No. 1.	$65-1885-2665$.	No. 1.	$73-1105-1561$.
2.	$377-1885-2639$.	2.	$155-1105-1555$.
3.	$593-1885-2599$.	3.	$221-1105-1547$.
4	$667-1885-2581$.	4.	$367-1105-1519$.
5.	$719-1885-2567$.	5.	$391-1105-1513$
6.	$965-1885-2485$.	6.	$455-1105-1495$.
7.	$1015-1885-2465$.	7.	$533-1105-1469$.
8.	$1085-1885-2385$.	8.	$595-1105-1445$.
9.	$1297-1885-2329$.	9.	$799-1105-1343$.
10.	$1363-1885-2291$.	10.	$809-1105-1337$.
11.	$1409-1885-2263$.	11.	$923-1105-1261$.
12.	$1537-1885-2171$.	12.	$995-1105-1205$.
13.	$1651-1885-2093$.	13.	$1057-1105-1151$.

Observe that had the conditions, included "prime" then the four trapezoids only answering for 1885, are Nos. 3, 5, 9, and 11. For 1105, Nos. 1, 4, 10, and 13, as given above.

Solved under a slightly different conception by *G. B. M. Zerr*, and exhaustively discussed by Hon. *Josiah H. Drummond*, of Portland, Maine, in a paper which we expect to give later.

3. Proposed by J. A. CALDERHEAD, B. Sc., Superintendent of Schools, Limaville, Ohio.

Given the simultaneous angular velocities of a body about the principal axes through its center of of inertia, find the position of these axes in space at any assigned instant.

I. Solution by the Proposer.

Represent the axes, at first by α, β, γ; and if q be the quaternion defined in § 372 (*Tait's Quaternions*), and ω_1, ω_2, ω_3 (functions of the time) represent the angular velocities about the three axes in their new positions, we have obviously

$$2\, Vqq^{-1} = (e=)q(\omega_1\alpha + \omega_2\beta + \omega_3\gamma)q_{-1}.$$

Integrating this gives q, and the axes are then $q\alpha q^{-1}$, $q\beta q^{-1}$, $q\gamma q^{-1}$.

II. Solution by WILLIAM HOOVER, A. M., Ph. D., Professor of Mathematics and Astronomy, Ohio University, Athens, Ohio.

Angular velocities are resolved and compounded as are linear velocities. If ω_1, ω_2, ω_3 be the angular velocities designated in the problem, the resultant angular velocity is $V\overline{\omega_1^2 + \omega_2^2 + \omega_3^2} = \omega$.

The direction cosines are $\dfrac{\omega_1}{\omega}$, $\dfrac{\omega_2}{\omega}$, $\dfrac{\omega_3}{\omega}$, determining the required positions.

PROBLEMS.

8. Proposed by H. C. WHITAKER, B. S,. M. E., Professor of Mathematics, Manual Training School, Philadelphia, Pennsylvania.

Find a general expression for the (integral) co-ordinates of a triangle with sides of integral lengths.

9. **Proposed by Professor G. B. M. ZERR, A. M., Principal of High School, Staunton, Virginia.**

Wires of five different metals A,B,C,D,E, having resistances $a,b,c,d,e,$ have their ends soldered together at two junctions which are maintained at different constant temperatures. If the strength of current in E, when all five wires are continuous, is S,the strength of current when B, C, D, are cut is S_a, the strength of current when A, C, D, are cut is S_b, the strength of current when A, B, D, are cut is S_c, find the strength of current S_x, when A, B, C, are cut.

Solutions to these problems should be received on or before May 1st.

QUERIES AND INFORMATION.

Conducted by J. M. COLAW, Monterey, Va. All contributions to this department should be sent to him.

NOTE TO ARTICLE ON PAGE 42. On the hypothesis that at a given point in a given straight an angle can be made equal to any angle of a triangle, it follows,in Lobatschewsky's geometry, that an angle can be made less than any one given finite angle however small. But this need not surprise anyone, since in Euclid's geometry, we may get two angles each half of any given finite angle however small, by simply bisecting the given angle.—G. B. HALSTED.

I. Is theorem 4 of Lobatschewsky's theory of parallels sound ? It reads as follows: "Two straight lines perpendicular to a third never intersect, how far soever they be produced."

II. Is Lobatschewsky's theorem 4 in harmony with the assumtion that two straight lines perpendicular to a third do intersect "at infinity ?"

III. Is Lobatschewsky's theorem 4 in harmony with the assumtion that two straight lines perpendicular to a third do intersect "at a finite distance?"

IV. In order that a straight line may be finite must it have a beginning and a termination, that is, two ends ?

V. Can a straight line having two ends be infinite in length ?

VI. In his theorem 16, Lobatschewsky says: "All straight lines which in a plane go out from a point can, with reference to a given straight line in the same plane, be divided into two classes—into *cutting* and *not-cutting*.

The *boundary lines* of the one and the other class of those lines will be called *parallel to the given line*." Does Lobatschewsky regard the boundary line as a *cutting* or a *not-cutting* line, or neither ?

In proposition 33 he seems to teach that the boundary line between the cutting and the non-cutting lines is a cutting line. For he says, "hence not only does the distance between two parallels decrease (Theorem 24), but with the pro-longation of the parallels towards the side of the parallelism this at last wholly vanishes."

VII. What is Lobatschewsky's reason for adopting the hypothesis that the boundary line is a *cutting line* rather than a *non-cutting one?*

JOHN N. LYLE,
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